

**Report to Congress  
Pursuant to Section 1226 or the  
FY98 National Defense Authorization Act**

Section 1226 of the National Defense Authorization Act for FY98 states that "The Secretary of Defense shall prepare a report...on the pattern of military modernization of the People's Republic of China. The report shall address the probable course of military-technological development in the People's Liberation Army and the development of Chinese security strategy and military strategy, and of military organizations and operational concepts, through 2015." Section 1226 further identifies 18 specific "matters to be included" and solicits coverage of any other "efforts by the People's Republic of China to enhance its strategic capabilities in such additional areas of strategic concern as the Secretary identifies." Finally Section 1226 directs for each subsection of the report inclusion of "analysis of implications of sales of products and technologies to entities in China."

This report, submitted in response to Section 1226, addresses the broad issues identified for attention as well as the "additional matters to be included,...areas of concern as the Secretary identifies,...(and) "implications of sales and products and technologies to entities in China."

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**FUTURE MILITARY CAPABILITIES AND STRATEGY OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**1. The goals of Chinese security strategy and military strategy.**

*Security Strategy*

China's primary national goal is to become a strong, unified, and wealthy nation that is respected as a great power in the world and as the preeminent power in Asia. The Chinese see their country as a developing power whose nuclear forces and seat on the UN Security Council already bestow some of the attributes of a great power. They look forward, however, to achieving a status of parity in economic, political, and military strength with the world's leading powers by the middle of the next century.

China's grand strategy for achieving this national goal is to promote rapid and sustained economic growth; raise the per capita income of its people to the global norm for advanced nations; improve the social quality of life for its people including health and education on a par with the leading nations of the world; raise technological levels in sciences and industry; maintain the political unity and stability of the nation; protect

national sovereignty and territorial integrity; secure China's access to global resources; and, promote China's role as one of the five or six major poles in a new multipolar world.

Although China continues to promote the notion of national self-sufficiency and independence, its strategy also encompasses greater integration into global affairs. This involves adjusting commercial policies in order to gain maximum benefits from foreign trade and investment, which have served as the twin engines of China's economic development. Politically, there is a greater willingness to participate in multinational fora and a public relations effort to foster a benign image of a China interested in peaceful development and progressing toward meeting international norms. China does not seek hegemony in Asia or elsewhere, although its leaders hope to achieve a position where Asian countries and those with interests in Asia take no actions which conflict with China's interests.

This strategy also encompasses a domestic political component, namely the continued governance of China by the Chinese Communist Party (CCP). China's strategic vision is that of the CCP and its leaders remain firmly committed to its realization. The CCP has ruled China for nearly half a century and, during that period, its leaders have exhibited no inclination to share their monopoly of power. China's leaders, however, are beset by a host of internal problems--some the result of the country's economic success, others the legacy of the planned economy they are gradually dismantling--which could threaten the stability and longevity of the regime if unresolved over time. Large-scale unemployment (likely to grow as reform of state-owned enterprises proceeds), separatist and human rights agitation, worker migration from rural to urban areas, an ever growing population, environmental and ecological concerns, and widespread corruption within both state and Party entities are contributing to popular discontent and disillusionment over the future of both China and its Communist Party.

China's security strategy strives to enhance the military, political, and economic components of national power. Beijing places top priority on continued economic growth and industrial sector development. China's National Defense Law identifies six military tasks that underlie this objective:

- (1) Modernize the People's Liberation Army (PLA);
- (2) Defend China's territorial sovereignty;
- (3) Deter and resist aggression by global and regional hegemons;
- (4) Support the Party's reunification policies;
- (5) Ensure domestic security and stability;
- (6) Support the national economic modernization program.

China seeks to take advantage of the current relatively benign international environment, in which there are no major external threats to China's security, by selectively modernizing its military forces in a measured and fiscally responsible manner. Beijing assesses that, barring a declaration of independence by Taiwan, the chance of a large-scale unavoidable conflict is almost negligible over the next decade and a half.

## *Military Strategy*

Since the early 1990s, the focus of Chinese military strategy has been on preparing for potential military contingencies along China's southeastern flank, especially in the Taiwan Strait and South China Sea. Thus China's goal is to field forces capable of rapidly deploying to fight and win a future regional war under high-technology conditions along China's periphery. The Persian Gulf War underscored for Beijing the need to improve the PLA's ability to fight against an adversary which possesses advanced information technologies and long-range, precision-guided weapons. Chinese perceptions of an emerging military-technological revolution have increased the urgency of gaining the capability to fight a high-technology war. To realize this goal, the PLA has undertaken a long-term military modernization program which currently is focused on reducing the overall size of the force by some 500,000 personnel; equipping it with more modern weapons, either acquired from abroad or produced domestically; and, developing a better educated and technologically skilled force, both in the officer and enlisted ranks. To support and sustain these forces, China is trying to establish a more effective national mobilization system for shifting the military, government, and industry from peacetime to war footing. If war were to become inevitable, China's military strategy would be to contain and limit the conflict, and to fight with sufficient force and tactics to win as quickly as possible, achieving a military solution before outside powers could intervene and before vital trade and investment were disrupted.

## **2. Trends in Chinese strategy regarding the political goals of the People's Republic of China in the Asia-Pacific region and its political and military presence in other regions of the world, including Central Asia, Southwest Asia, Europe, and Latin America.**

China's strategy to establish itself as the leading political power in Asia is based on the premise of expanding Chinese influence throughout the region through active diplomacy and the development of cooperative economic ties, political support for initiatives to maintain regional peace and stability, and an expanded role in supporting multilateral organizations. This strategy has led China to participate in multilateral organizations such as the ASEAN Regional Forum, in an effort to defuse territorial disputes with the ASEAN nations by diplomacy rather than through force. In addition, China has sought to reduce the potential for conflict by resorting to confidence building measures with some of its most important Asian neighbors, including Russia and several of the Central Asian republics. This political strategy also is reflected in China's efforts to reduce tensions and maintain stability on the Korean peninsula.

The Chinese realize, however, that attaining recognition as the preeminent political power in Asia will require the weakening of U.S. political influence in the region. Although China has no plan to lead a faction or bloc of nations in directly challenging U.S. power, its international political activities and certain of its economic and military policies are designed to achieve the same result. Beijing espouses a multipolar view of the world where power is shared equally among five or six nations or blocs and is engaged in gathering political support for this view.

Outside of the Asia-Pacific region, China is pursuing an assertive, world-wide diplomatic campaign aimed at promoting Beijing's positions on such issues as Taiwan, human rights, proliferation and trade. In recent years, China's goals have turned increasingly to support of economic and commercial interests as exemplified by China's participation in the Asia-Pacific Economic Cooperation (APEC) forum and its efforts to join the World Trade Organization (WTO). Beijing remains committed to maintaining, if not expanding, its political and economic presence in such areas as Central and Southwest Asia, Europe, Latin America, and Africa; however, China has no ambitions to establish a military presence in these regions.

**3. Developments in Chinese military doctrine, focusing on (but not limited to) efforts to exploit the emerging Revolution in Military Affairs or to conduct preemptive strikes.**

China's military doctrine--commonly referred to as "local war under high tech conditions"--while still defined by the precepts of People's War and active defense is focused on preparing Chinese military forces to fight small-scale, regional conflicts along China's periphery. Execution of this doctrine requires smaller, more specialized quick-reaction forces capable of rapidly dealing with border incursions or striking outside China's borders. By implication, this doctrine, although defensive in nature, requires that the PLA possess a limited offensive and force projection capability; it also includes the option of preemptive military action.

Chinese military planners are working to incorporate the concepts of modern warfare attributed to the *Revolution in Military Affairs* to Chinese military doctrine, particularly as they relate to information operations and strike warfare. Beijing is engaged concurrently in a weapons modernization program intended to fill short-term gaps in its defense and to improve, over the longer term, the military's capability to counter more powerful forces. For example, Beijing is developing or seeking to acquire such force multipliers as mobile ballistic missile systems, land-attack cruise missiles, and advanced surface-to-air missiles. China also is working to ameliorate weaknesses in C4I, training, and logistics so as to improve gradually the PLA's overall warfighting capability.

**4. Efforts by the People's Republic of China to enhance its capabilities in the area of nuclear weapons development.**

China has embarked on a ballistic missile modernization program, and a warhead modernization program probably exists to complement the missile program. The evaluation of new warhead technologies likely was completed by July 1996, when China announced its nuclear test moratorium. However, China's experience with the presumed newer warhead technologies is limited.

**5. Efforts by the People's Republic of China to develop long-range air-to-air or air defense missiles designed to target special support aircraft such as Airborne Warning and Control System (AWACS) aircraft, Joint Surveillance and Target Attack Radar System (JSTARS) aircraft, or other command and control, intelligence, airborne early warning, or electronic aircraft.**

### *Air-to-Air Missiles*

There is little evidence to suggest China has or is developing an air-to-air missile (AAM) specifically designed to counter special mission aircraft such as the Airborne Warning and Control System and the Joint Tactical Surveillance Targeting and Reconnaissance System. However, there are AAMs in China's inventory which could be used against these aircraft and Beijing is acquiring more modern missiles which could threaten them, to include indigenous versions of an advanced medium-range air-to-air missile (AMRAAM).

### *Surface-to-Air Missiles*

The capabilities demonstrated by coalition forces against Iraq during the early stages of Operation Desert Storm provided a vivid demonstration to Beijing that its vision of an adequate air defense fell woefully short in the face of precision weapons, cruise missiles, and stealth aircraft. In the aftermath of the Persian Gulf War, Beijing embarked on a measured effort to procure a modern, integrated air defense system. To date, China has purchased from Russia two variants of the SA-10/ GRUMBLE long-range surface-to-air missile (SAM) system, as well as the SA-15/GAUNTLET short-range tactical air defense missile system. China also is developing a number of indigenous air defense systems, including the HQ-9 advanced long-range SAM and the HQ-7 short-range tactical SAM. The HQ-9 is intended to counter high-performance aircraft, cruise missiles, and tactical ballistic missiles. The HQ-7--also known as the FM-80--includes both land-based and naval variants. China's air defense capability is expected to improve over time as it develops its own indigenous SAM systems and procures additional missiles and technology from foreign sources with the ultimate goal of integrating these systems into a cohesive infrastructure. While it may take several decades to realize this goal, Beijing already has demonstrated a rudimentary local integrated air defense capability with its mobile Tactical Air Defense System.

## **6. Efforts by the People's Republic of China to develop a capability to conduct "information warfare" at the strategic, operational, and tactical levels of war.**

In recent years, the PLA has shown an exceptional interest in information warfare (IW) and has begun programs to develop IW capabilities at the strategic, operational and tactical levels as part of its overall military modernization effort. The PLA's interest in IW is reflected particularly in the number of articles which appear frequently in military publications and in the use of IW-related scenarios in exercises and wargames.

The PLA's desire to develop a capability to conduct IW at the strategic level is best mirrored in the numerous articles and papers on military strategic and doctrinal issues as they relate to IW. These articles suggest that the PLA, at a minimum, understands the requirements involved in integrating the technical and operational elements of IW in order to attack the enemy's decision-making systems, apply military deception, and conduct operational security, psychological operations, and electronic warfare. There also

are recurring references to innovative training and education programs designed to prepare China's military forces for "local war under high tech conditions," which includes an IW dimension.

At the operational level, Chinese military writers often have noted that the information gathered by the U.S. prior to and during the 1991 Gulf War provided the coalition forces with a critical advantage over the forces of Saddam Hussein. In an effort to counter this advantage, the PLA is improving its indigenous capabilities to collect, process and disseminate information. The PLA also is said to be incorporating IW--including concepts learned from exploiting U.S. military doctrine--in studies and exercises aimed at improving its staff planning process and moving the PLA toward "jointness." Recently, a series of articles in the official *Liberation Army Daily* described military exercises which incorporated such IW concepts as computer network attack and computer network defend exercises at both the operational level and tactical levels. These exercises also included elements of electronic warfare, psychological operations, military deception, operations security, and physical destruction, representing the full spectrum of IW at the operational level.

At the tactical level, the Chinese military appears to be focused largely on information warfare as it relates specifically to electronic warfare (EW). China recognizes that the army which is capable of achieving "information superiority" on the battlefield in future high-tech wars will seize the initiative and attain victory. As such, the PLA views EW as an integral part of its IW planning and is currently emphasizing improvements in EW training and acquisitions of more modern EW equipment.

## **7. Development by the People's Republic of China of capabilities in the area of electronic warfare.**

China views electronic warfare (EW) as a fourth dimension of ground, naval, and air combat. It currently is engaged in an extensive program to upgrade its EW technology, equipment and training. China's current inventory of EW equipment includes a combination of 1950s to 1980s vintage technology. This equipment appears to be fielded haphazardly, with a few "select" units receiving the most modern equipment. China is seeking to procure state-of-the-art intercept, direction finding, and jamming equipment to upgrade poorly equipped ground-based, shipborne and airborne forces, and to serve as a template for a robust reverse-engineering effort. In so doing, China has established close commercial ties with electronic companies in numerous foreign countries.

### *Ground Forces*

The PLA ground forces consider EW a critical area for modernization efforts, as it can act as a combat multiplier, whether on offense or defense. The PLA will employ EW assets to support all echelons through the use of electronic countermeasures (ECM) consisting of active and passive jamming of communications and non-communications targets, and electronic support measures (ESM) consisting of intercept and direction-

finding systems. Physical destruction of the enemy's communications and non-communications systems also is considered a component of EW.

EW is employed to disrupt the enemy's use of the electromagnetic spectrum during time frames critical to enemy operations to render the enemy ineffective in achieving his objectives. EW also serves to protect critical friendly point targets, such as command posts, key weapons sites, troop formations, and logistics nodes.

The PLA will attempt to establish EW dominance on the battlefield during the early, critical stages of battle. The PLA would use EW to support military operations by denying or degrading enemy use of radar and communications systems, as well as protecting friendly use of the electromagnetic spectrum. PLA ground force EW capabilities likely will increase qualitatively and quantitatively over the next 20 years.

Although the Chinese have written about applications of radio frequency (RF) weapons and a Navy official has been quoted as stating that RF weapons are among those weapons that the Chinese military will need in the 21st century, the Chinese do not have an RF weapon capability at this time. They are, however, developing high-power microwave (HPM) sources that could form the basis for some types of RF weapons. They also are conducting studies of electronics susceptibility to HPM pulses and of HPM propagation through the atmosphere.

An analysis of publications in technical journals suggests that one RF weapon concept the Chinese are investigating is the HPM missile warhead. This is an explosively powered RF system that would be delivered to the vicinity of a target and, upon detonation, would emit a single intense pulse of HPM energy to upset or damage electronics in enemy equipment. If this type RF weapon is feasible--and it is at present unclear whether it is possible to produce enough RF energy to negate electronics at a greater range than a high-explosive warhead of the same size would cause blast damage--then the Chinese should be able to deploy such weapons by 2015.

Another possibility is a directed-energy RF weapon in which a RF beam is propagated over kilometer ranges against targets such as manned aircraft and guided missiles. Chinese deployment of such RF weapons by 2015 is assessed to be technically feasible, although as with the HPM warhead the critical unresolved issue is whether these RF weapons would be more effective at accomplishing the desired military mission than would more conventional weapon systems. A less stressing RF weapon concept for which the requisite technology is now mature and that therefore could be deployed in the near term is a countermine system on a ground vehicle to dud or predetonate mines with electronic fuzes.

#### *Naval Forces*

The PLA Navy's (PLAN's) major combatants (frigates, destroyers, and eventually aircraft carriers) are expected to have an extensive electronic warfare (EW) suite. The suite will have intercept systems designed to detect and locate enemy radar and

communications signals, along with the capability to employ various types of countermeasures against radar, communications, and electro-optical/infrared threats. Minor combatants (missile patrol boats) will have at least radar intercept systems and capabilities for countering radar and electro-optical/infrared threats. Shipboard EW equipment will be integrated together via automated data exchange interfaces between the intercept and jamming systems. Intercept systems against radar signals could cover from 500 MHz to 40 GHz. Some combatants could have intercept capabilities against communications and data signals. Jamming capabilities will consist of both active and passive methods for targeting airborne surveillance and fire control radars and missile seekers. Some ships may have jamming capabilities against communications and data transmissions. Submarines (attack and ballistic missile) are expected to carry passive intercept systems for detecting and locating enemy radar emissions. These systems will cover from around 500 MHz to 40 GHz.

PLAN combat aircraft could have self-protection jamming systems for use against enemy fire control radars and missile seekers. Some aircraft will be modified to conduct offensive EW missions in support of anti-surface warfare. Unmanned aerial vehicles may be used for surveillance and jamming support missions.

The Chinese are expected to produce the majority of the naval EW systems; however, some foreign systems or components will be imported from various sources, mostly likely in Europe and Russia. However, the performance of Chinese naval EW systems probably will continue to lag behind state-of-the-art Western EW systems.

The PLAN will emphasize multiple methods and techniques for protecting its own radar and communications from enemy electronic attack operations. For radars, electronic protection (EP) features will include frequency agility (RF hopping), antennas designed to significantly reduce signal sidelobe levels, digital processing for sidelobe cancelling, trackers operating in the millimeter wave region, and electro-optical/infrared trackers. Communication EP features will emphasize the use of frequency hopping signals and extensive use of fiber-optic cabling for shore-based communications networking. Strict communications security (COMSEC) and emission control (EMCON) procedures will be emphasized.

#### *Air Forces*

The PLA Air Force (PLAAF) is in the process of upgrading its EW capability through technology acquisition, reverse engineering, and indigenous research and development. At present, the capabilities of most airborne EW equipment in the PLAAF inventory are extremely limited by Western standards. China's new designs, often offered for sale at air shows, while displaying significant improvements over older systems, remain simple by modern standards. Moreover, China's current inventory of deployed EW assets is inadequate both in size and capability to significantly influence the outcome of combat against a more modern adversary. China is developing a number of new standoff EW aircraft which are likely to enter the inventory over the next 20 years. These assets may be augmented by escort jamming aircraft. Additionally, China is expected to increase the

capabilities of self-protection jammers on all of its new tactical aircraft. The PLAAF also can be expected to pursue new airborne SIGINT collection platforms in various EW configurations.

**8. Efforts by the People's Republic of China to develop a capability to establish control of space or to deny access and use of military and commercial space systems in times of crisis or war, including programs to place weapons in space or to develop earth-based weapons capable of attacking space-based systems.**

China is said to be acquiring a variety of foreign technologies which could be used to develop an anti-satellite (ASAT) capability. Beijing already may have acquired technical assistance which could be applied to the development of laser radars used to track and image satellites and may be seeking an advanced radar system with the capability to track satellites in low earth orbit. Beijing also may have acquired high-energy laser equipment and technical assistance which probably could be used in the development of ground-based ASAT weapons. The Chinese also may be developing jammers which could be used against Global Positioning System (GPS) receivers. In addition, China already may possess the capability to damage, under specific conditions, optical sensors on satellites that are very vulnerable to damage by lasers. However, given China's current level of interest in laser technology, it is reasonable to assume that Beijing would develop a weapon that could destroy satellites in the future.

Exploitation of space--to include manned space operations--remains a high priority. Although nearly all major aspects of China's manned space program began within the last five years or so, the Chinese are still aiming for a possible first manned launch before the end of the decade. While one of the strongest motivations for this program appears to be political prestige, China's manned space efforts could contribute to improved military space systems in the 2010-2020 time frame.

**9. Trends that would lead the People's Republic of China toward the development of advanced intelligence, surveillance, and reconnaissance capabilities, including gaining access to commercial or third-party systems with military significance.**

China has the capability to launch military photoreconnaissance satellites; however, the technology employed is outdated by Western standards. The Chinese do not possess a real-time photoreconnaissance capability. China eventually may deploy advanced imagery reconnaissance and earth resource systems with military applications. The Chinese also may attempt to deploy a near-real-time electro-optical imaging satellite within the next decade, as well as a high-resolution film-based photoreconnaissance satellite. In the interim, the Chinese can be expected to exploit commercial SPOT and LANDSAT imagery. Use of other commercial satellite imagery also can be anticipated as it becomes available. China already has launched two low-orbit meteorological satellites and a geosynchronous weather satellite. Although China has received some degree of foreign technological assistance in the areas of reconnaissance, surveillance and targeting capabilities, many of its system development efforts appear to have a substantial indigenous component. In the

future, however, Beijing could be expected to acquire and incorporate greater amounts of foreign technology and hardware to expedite program development.

**10. Efforts by the People's Republic of China to develop highly accurate and stealthy ballistic and cruise missiles, including sea-launched cruise missiles, particularly in numbers sufficient to conduct attacks capable of overwhelming projected defense capabilities in the Asia-Pacific region.**

Over the past decade, China has invested heavily in its infrastructure to develop and produce new ballistic and cruise missiles. Beijing currently is upgrading and expanding the size of its ballistic missile force, as well as developing new types of ballistic and cruise missiles.

*SRBMs/MRBMs*

China's CSS-6 (DF-15) or M-9 road-mobile short-range ballistic missile (SRBM) has been operational since 1994. This missile can deliver a 500-kilogram payload to a maximum range of 600 kilometers, enabling Chinese forces to attack with conventional firepower areas which previously were unreachable, even by air platforms. The 300-kilometer range CSS-X-7 SRBM--better known by its export designator, the M-11--has not yet been deployed by Chinese forces. However, an improved, longer-range version of this missile already may be under development. Application of satellite-assisted navigation technology would improve the accuracy of both missiles. China's first road-mobile, solid-propellant ballistic missile is the CSS-5 (DF-21) medium-range ballistic missile (MRBM). It has been operationally deployed since around 1991. With an estimated range in excess of 2,000 kilometers, it can strike most of China's neighbors. Development of a longer-range version may be underway.

*ICBMs/SLBMs*

In the first decade of the twenty-first century, China is expected to begin deployment of two new road-mobile, solid-propellant intercontinental ballistic missiles (ICBMs) currently in development: the DF-31 will have an estimated range of about 8,000 kilometers; the other ICBM will have an estimated range of some 12,000 kilometers. China's first generation submarine-launched ballistic missile (SLBM), has not yet reached initial operational capability (IOC), even though a follow-on SLBM already may be under development.

*Cruise Missiles*

China is seeking foreign cruise missile and production-related technologies; it already may have acquired engine, guidance and control, and low-observable technologies. This high level of investment could allow China to increase the pace of cruise missile development; however, Beijing could encounter problems with propulsion systems and mass production capabilities.

China is attempting to purchase from Russia two SOVREMENNYY-class destroyers, together with SS-N-22/SUNBURN antiship cruise missiles (ASCMs). The acquisition of two SUNBURN-equipped SOVREMENNYYs would have marginal impact on the balance of power in the region; however, were China to obtain a significant number of additional missiles, it could retrofit them on other major combatants and improve the PLA Navy's offensive punch against surface naval targets. Any attempt to reverse-engineer the SUNBURN missile probably would take ten years. In the interim, technological improvements that the Chinese are said to be making to the C-801/SARDINE and the C-802/SACCADE could provide a modest upgrade to China's antiquated ASCM force. In addition, the Chinese are said to be working on a submerged-launch version of the C-802.

China is developing land-attack cruise missiles (LACMs) for theater warfighting and strategic attack. These missiles appear to have a relatively high development priority. Chinese research and development of LACMs is aided by an aggressive effort to acquire foreign cruise missile technology and subsystems, particularly from Russia. The first LACM to enter production probably would be air-launched from bombers and could be operational early in the next century. A second generation, longer-range LACM probably would be fielded several years later.

#### **11. Development by the People's Republic of China of command and control networks, particularly those capable of battle management of long-range precision strikes.**

China has an extensive network of hardened, underground shelters and command and control facilities for both its military and civilian leadership. Fear of a possible war with the former Soviet Union in the 1960s and 1970s prompted Beijing to expend considerable resources constructing national level command posts, civil defense facilities and associated communications. These facilities are intended to ensure survival of China's leadership and provide a refuge from which it can maintain control over the country's military forces. These facilities are supported by both civil and military communications networks. Chinese military national level command and control communications are carried over multiple transmission systems in order to create a military communications system that is survivable, secure, flexible, mobile and less vulnerable to exploitation, destruction or electronic attack. China's communications networks are capable of supporting PLA military operations within China's borders. While they could be degraded by an enemy, they could not be denied completely.

C4I modernization and automation has been a top Chinese priority since at least 1979. This effort has produced a command automation data network capable of rapidly passing operational orders down the chain of command and moving information to national and theater level decision makers. However, China's C4I infrastructure, including the command automation data network portions, is not capable of controlling or directing military forces in a sophisticated, western style joint operating environment. The command automation data network is capable of supporting PLA peacetime operations within China's borders. The command automation data network also can support limited preplanned conventional attack options along China's periphery. However, China's C4I infrastructure cannot support large scale, joint force projection

operations at any significant distance from the country's borders. China still lags far behind western standards for controlling complex joint military operations and lacks the robust C4I architecture required to meet more effectively the demands of the modern battlefield.

**12. Efforts by the People's Republic of China in the area of telecommunications, including common channel signaling and synchronous digital hierarchy technologies.**

Currently, Chinese telecommunications cable networks use primarily Plesiochronous Digital Hierarchy (PDH) architecture, with maximum transmission rates of up to 140 Mbps. Western telecommunications firms have installed a small number of Synchronous Digital Hierarchy (SDH) fiber optic cable systems, with transmission rates ranging from 2.5 to 10 Gbps. Western involvement is critical for Chinese adoption of SDH technology. Western firms not only design and install SDH networks, but they also transfer the required manufacturing and technical knowledge through joint venture companies. After 2002, SDH will entirely replace the existing PDH network and China's fiber optic cable systems will be composed entirely of SDH systems. China also will expand the capacity of existing and newly installed SDH fiber networks through the use of Wave Division Multiplexing (WDM). WDM increases the capacity of optical fiber cable by splitting the light signals into different wavelengths and sending them simultaneously through the cable. WDM will transmit two (or more than 40) signals of different wavelengths in the same direction over a single strand of fiber. This combined signal is separated at the receiving end. For example, a variation of WDM, "Quad-WDM," can increase the transmission capacity of a 2.5 Gbps cable to 10 Gbps. WDM uses erbium doped fiber amplifiers (EDFA) instead of repeaters. Further, China is employing Asynchronous Transfer Mode (ATM)/Frame Relay technology in provincial and interprovincial communications links. Adoption of ATM technology will increase the capacity of Chinese data networks and is well suited to meeting future increases in demand.

Chinese telecommunications switching is now almost entirely digital, relying on Digital Stored Programmed Controlled (DSPC) equipment. China produces its own DSPC equipment for export as well as civil and military users. Common Channel Signaling Number 7 (SS7) is used widely for both domestic and international service. Out of band SS7 signaling allows the Chinese to use their voice grade circuits in a more efficient manner than previous in band signaling methods. By 2000, SS7 will be the standard long distance signaling protocol in China.

**13. Developments of the People's Republic of China of advanced aerospace technologies with military applications (including gas turbine "hot section" technologies).**

China is engaged in a number of programs aimed at developing advanced aerospace technologies which have military applications.

*Turbine Engine Technology.* China has designed, manufactured and tested, but never entered into production, an indigenous turbine engine system. Whatever recent

progress China has made in this area is due, in large part, to foreign assistance, particularly from Russia.

*Hypersonic Research.* China is conducting limited hypersonic research including vehicle studies and ramjet development. With respect to ramjet activities, materials development, fuel injection, mixing and combustion studies appear to be receiving the greatest attention with limited research on thermal management and fuels also being pursued. Research papers indicate that the Chinese are keenly aware of hypersonic efforts in the United States, Europe and Russia, and that they leverage this research to support their programs. The hypersonic vehicle studies are essentially paper studies at present, with the primary application being an advanced launch vehicle. Overall, the level of these research efforts is relatively small compared to Western and Russian programs.

*Focal Array and Infrared Technologies.* China is mainly active with research and development programs in focal array technology using materials such as platinum silicide (PTSI), mercury cadmium telluride (MCT), indium antimonide (INSB), and gallium arsenide/aluminum gallium arsenide (GAAS/ALGAAS). These materials are used in the manufacturing of advanced technology focal planar array detectors. China is not a world leader in infrared detector technology.

*Microelectro Mechanical Systems (MEMS).* Chinese MEMS development capability lags behind that of other leading MEMS-producing countries like the United States, Japan, South Korea, and several European countries. China, however, has been active in its efforts to acquire MEMS devices and related technologies. There are a number of organizations in China--mostly affiliated with universities--which conduct research related to MEMS technology; however, Chinese MEMS technology lags the state-of-the-art by five years or more.

#### **14. Programs of the People's Republic of China involving unmanned aerial vehicles, particularly those with extended ranges or loitering times or potential strike capabilities.**

Over the years, Beijing has produced a variety of unmanned aerial vehicles (UAVs), principally for use as target drones; others have been built for reconnaissance and surveillance purposes. Most of China's early UAV's were reverse-engineered versions of either Russian or American models. China's most advanced UAV is the ASN-206. This UAV, capable of both day and night reconnaissance, can be used for border patrol operations; artillery targeting positioning and adjustment; nuclear radiation probing or sampling; aerial photography; prospecting and surveying; and, traffic monitoring and control. It can carry a still camera, an infrared camera or a real-time television camera. The ASN-206 has a ceiling of 5,000-6,000 meters, a maximum level air speed of 210 kilometers per hour, and an endurance time of 4-8 hours. It has a control range of 150 kilometers from the ground control station.

Beijing is said to be developing a rotary-wing UAV, apparently for use as a reconnaissance platform. It also may have concluded an agreement with a foreign supplier to acquire a high altitude, long endurance UAV, together with a ground control

station, and either production or co-production rights. This UAV would provide China with the capability to conduct extended imagery reconnaissance and surveillance, electronics signals collection, and electronic warfare missions; tactical ground force commanders also could use the platform for intelligence collection, artillery spotting, or communications.

**15. Exploitation by the People's Republic of China for military purposes of the Global Positioning System or other similar systems (including commercial land surveillance satellites), with such analysis and forecasts focusing particularly on those signs indicative of an attempt to increase accuracy of weapons or situational awareness of operating forces.**

Numerous organizations within China's military-industrial complex are believed to be using the Global Positioning System (GPS) and Global Navigation Satellite System (GLONASS) to improve the accuracy of Chinese weapons and the situational awareness of the China's operational military forces. Since at least the early 1990s, these organizations have tried to obtain civilian GPS technology and equipment for use in a variety of weapons systems. China may be engaged in an effort to use satellite navigation to improve the accuracy of its missile force. GPS updates would provide the potential to improve missile accuracy through midcourse guidance correction and increase the operational flexibility of road-mobile platforms.

The Chinese aerospace industry also is seeking to integrate GPS guidance technology into fighters and helicopters. The China Aerospace Corporation displayed a GPS receiver at an exhibition in Beijing in September 1996 and provided brochures advertising both a 12-channel GPS receiver and a 12-channel GPS/GLONASS receiver. One brochure showed a space launch vehicle, suggesting GPS use in missile applications. Information obtained at a more recent air show indicates that all of China's new fighters will incorporate GPS navigation systems. China's military-backed industries also have entered into joint ventures with foreign firms to produce GPS receivers, which may find their way to military weapons. To complement GPS/GLONASS navigation aids, the Chinese have been attempting to acquire commercial satellite imagery from various foreign countries. This widely available satellite imagery could be used in conjunction with GPS/GLONASS to develop digital terrain maps for targeting, missile guidance, and mission planning.

**16. Development by the People's Republic of China of capabilities for denial of sea control, including such systems as advanced sea mines, improved submarine capabilities, or land-based sea-denial systems.**

Beijing can be expected to rely heavily on its naval forces to develop an effective active offshore defense capability and enhance its military stature in the region. China considers the safeguarding of its sovereignty along coastal waters, to include the East and South China Seas, an essential component of its national security and intends to improve the ability of its Navy to exercise sovereignty rights throughout these waters. However, the Chinese Navy will be unable to perform comprehensive sea denial operations in its coastal waters for at least the next decade. The Navy has made some improvements in its

sea denial military capabilities, particularly with respect to sea mines and submarines; however, it has placed a lesser emphasis on the development of its land-based sea denial systems such as land-based cruise missiles due to its strategy of active, offshore defense.

### *Sea Mines*

The Chinese Navy maintains a large inventory of naval mines and is capable of conducting mining operations within the country's coastal seas. Most of China's surface ships are equipped with mine rails and are capable of laying mines as a secondary mission. The Navy conducts mine training exercises using surface ships, submarines, and aircraft in coastal areas and can conduct both mine laying and minesweeping operations. Although the Navy does not train outside coastal areas routinely, it could conduct mine laying and mine sweeping operations further offshore. In an apparent effort to improve the mine warfare capabilities of its Navy, China is attempting to acquire state-of-the-art mine warfare technology, to include micro-processors, rocket propulsion, remote control, and mine counter-countermeasures.

China currently produces numerous types of naval mines, to include the EM11 bottom-influence mine; the EM31 moored mine; the EM32 moored influence mine; the EM52 rocket-propelled rising mine; and, the EM53 ship-laid bottom influence mine which is remotely controlled by a shore station. China is believed to have available acoustically activated remote control technology for its EM53. This technology probably could be used with other Chinese ship-laid mines including the EM52. Application of this technology could allow entire mine fields to be laid in advance of hostilities in a dormant condition and activated when required or deactivated to allow safe transit for friendly ships. Over the next ten years or so, China likely will attempt to acquire advanced propelled-warhead mines, as well as submarine-launched mobile bottom mines, to expand the Navy's stand-off mining capabilities.

### *Submarines*

There are approximately 70 submarines of all types in the Chinese naval inventory. This number is projected to decline to about 40 ships over the next 20 years, as older platforms are retired and replaced by smaller numbers of more modern boats. However, the quality and capabilities of China's submarine fleet are expected to improve as China begins constructing more modern ships with Russian assistance. Individual submarines likely will become more difficult to detect and will be better armed. China's submarine force is expected to improve its offensive anti-surface warfare capability with the deployment of submarine-launched cruise missiles but realize only minor improvements in its ability to conduct antisubmarine warfare.

China's most modern, indigenously-built diesel attack submarine is the SONG-class. It is said to incorporate a significant amount of foreign technology. China also has continued construction of the older, but proven, MING-class submarine in order to maintain the numbers in its inventory as obsolete ROMEO-class boats are retired. Beijing may be planning to build a new class of nuclear-powered ballistic missile submarine

in coastal regions and is capable of landing 1-3 infantry divisions, depending on the mix of equipment and stores for immediate resupply. China probably has never conducted a large-scale amphibious exercise which has been fully coordinated with air support and airborne operations. If China were to use its civilian merchant fleet, its ability to move forces likely would increase. Inadequate air defense, poor command and control, together with lack of experience and training in cross-beach movement of forces, however, would be critical shortcomings. The size of the amphibious fleet most likely will decline to about 55 units over the next 20 years, although its lift capacity will increase albeit slightly. China's naval marine force consists of one marine brigade numbering some 5,000 personnel based in the South Sea Fleet. Its size is projected to remain fairly stable over the next 20 years. Certain regular ground force units appear tailored, equipped and trained for maritime operations and to augment the marine force as needed.

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